PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

CHEMISTRY



MARK SCHEME

TOPIC 1: KEY CONCEPTS IN CHEMISTRY: TYPES OF SUBSTANCE (PAPER 2)

SCORE	PERCENTAGE
/182	%

STEMUP

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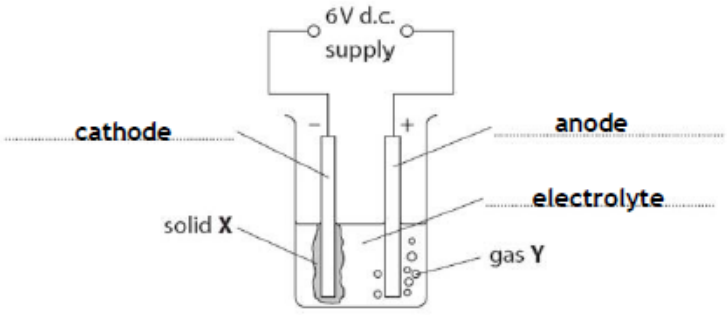
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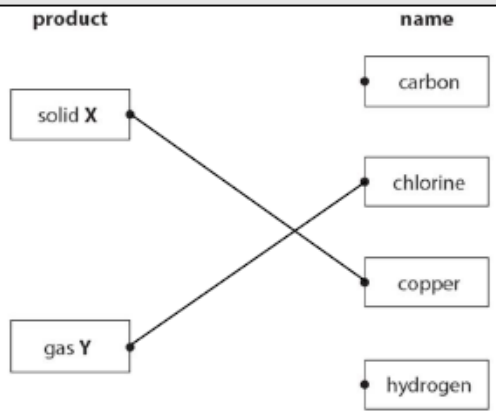
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Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
(i)		All 3 correct scores 2 marks 1 or 2 correct scores 1 mark allow copper chloride **solution** to replace electrolyte	**AO1-2 (2)**

Question number	Answer	Additional guidance	Mark
(ii)		one mark for each line do not award mark if more than one line is drawn from each box on the left	AO1-2 (2)

Question number	Answer	Additional guidance	Mark
(iii)	An explanation linking the following • no current will flow / solid ionic compounds do not conduct electricity (1) • (because) **ions** can't move / **ions** in a lattice (1)	Allow reverse arguments allow no electricity flows do not accept 'nothing happens' ignore charged particles reject electrons/atoms/molecules can't move if no other mark awarded allow 1 mark for if 'copper chloride isn't dissolved' / 'it will only work if ions are in solution'	AO1-1 (2)

(**Q02b 1SC0/1CF, June 2023**)

Q2.

Question number	Answer	Additional guidance	Mark
(i)	any one of the following • shiny • high {melting / boiling} point • good conductor of {electricity / heat} • malleable / ductile • grey coloured	 allow reflective surface allow easily shaped / can be drawn into wires allow silver **coloured** ignore density / sonorous / solid ignore strength / strong / hard	AO1-1 (1)

Question number	Answer	Mark
(ii)	**D** strontium is the only correct answer **A, B** and **C** are incorrect because they are all in a different group to magnesium.	**AO1-1 (1)**

(**Q04a 1SC0/1CF, June 2023**)

Q3.

Question number	Answer	Additional guidance	Mark
(i)	An explanation linking • simple covalent / simple molecular (1) • (because) <u>weak</u> intermolecular forces (of attraction) (1) • (so) only a small / low amount of {energy/heat} is needed (to break these forces) (1)	reject ionic / ions for MP1 & MP2 only ignore covalent alone allow weak intermolecular bonds reject weak covalent bonds reject hydrogen bonds reject weak (intermolecular) forces between bonds ignore less {energy / heat} reject breaking {covalent / ionic} bonds	**(3) AO1.1**

Question number	Answer	Mark
(ii)	**C** less less is the only correct answer **A** is incorrect as the particles will have less energy **B** is incorrect as the particles will move less **D** is incorrect as the particles will have less energy and move less	**(1) AO1.1**

Question number	Answer	Mark
(iii)	**B** Fractional distillation **A**, **C** and **D** are not correct as they would not separate oxygen and nitrogen	**(1) AO2.2**

(**QU03b 1SC0/1CH, June 2025**)

Q4.

Question number	Answer	Mark
(i)	**B** 2.8 is the only correct answer **A** is incorrect as there are too few electrons **C** and **D** are incorrect as there are too many electrons	**(1)** **AO** **1-1**

Question number	Answer	Additional guidance	Mark
(ii)	an explanation linking SOLID • is an (ionic) lattice / (ions are) held by strong (electrostatic) attractions (1) • so the **ions** {cannot move / are fixed / just vibrate} (1) SOLUTION • in solution the **ions** {can move / are free} (1)	allow giant structure / regular arrangement / regular structure for lattice allow atoms / (charged) particles in MP1 only ignore electrons for MP1 reject molecules / elements reject electrons allow liquid for solution reject electrons reject intermolecular forces	**(3)** **AO** **2-1**

(**Q06a 1SC0/1CF, June 2024**)

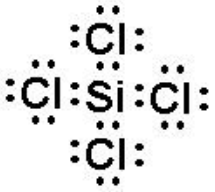
Q5.

Question number	Answer	Mark
(i)	**B** 2.8 **A** is incorrect as there are too few electrons **C** and **D** are incorrect as there are too many electrons	**(1)** **AO1-1**

Question number	Answer	Additional guidance	Mark
(ii)	an explanation linking SOLID • has an {(ionic) lattice / ions held by strong (electrostatic) attractions} (1) • so the **ions** {cannot move / are fixed / just vibrate} (1) SOLUTION • in solution the **ions** {can move / are free} (1)	allow giant structure / regular arrangement / regular structure for lattice allow atoms / (charged) particles in MP1 only ignore electrons for MP1 reject molecules / elements reject electrons allow liquid for solution reject electrons reject intermolecular forces	**(3)** **AO2-1**

(**QU02a 1SC0/1CH, June 2024**)

Q6.

Question number	Answer	Additional guidance	Mark
(i)	 all **four** bond pairs (1) rest of molecule correct (1)	MP2 dependent on MP1 electrons may be shown as dots or crosses or any combination electrons can be shown in any overlapping part of intersecting shells allow atoms unlabelled ignore inner shells, whether correct or otherwise	**(2)** AO2-1

Question number	Answer	Additional guidance	Mark
(ii)	An explanation linking • weak forces **between molecules/ intermolecular forces** (1) • little {**heat** / **energy**} needed (1)	MP2 can score even if MP1 not scored allow **intermolecular** bonds / bonds **between molecules** reject forces between {atoms / bonds / ions} for MP1 only ignore **less** energy needed / 'easy' to break ignore low temperature	**(2)** AO1-1

(**QU05a 1SC0/1CH, June 2024**)

Q7.

Question number	Answer	Mark
(i)	An answer that provides a description by making reference to: • one electron (transferred) (1) • transferred from sodium to fluorine (1)	**(2)**

Question number	Answer	Mark
(ii)	An explanation that combines identification - understanding (1 mark) and reasoning/justification - understanding (1 mark): • (both solid and molten) contained charged particles/ions (1) • (ions) free to move in molten but not in solid (1)	**(2)**

(**Q05d 1SC0/2CF/S2, SAM**)

Q8.

Question number	Answer	Mark
(i)	An answer that provides a description by making reference to: • one electron (transferred) (1) • transferred from sodium to fluorine (1)	**(2)**

Question number	Answer	Mark
(ii)	An explanation that combines identification - understanding (1 mark) and reasoning/justification - understanding (1 mark): • (both solid and molten) contained charged particles/ions (1) • (ions) free to move in molten but not in solid (1)	**(2)**

(**Q01d 1SC0/2CH/S2, SAM**)

Q9.

	Answer	Acceptable answers	Mark
	D weak forces of attraction between the oxygen molecules		**(1)**

(**Q19 1SC0/1CH, June 2013**)

Q10.

	Answer	Acceptable answers	Mark
	D weak forces of attraction between the oxygen molecules		**(1)**

(**Q10 1SC0/2CH, June 2013**)

Q11.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	A description including carbon (1) atom(s) (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	covalent Ignore giant molecular		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	fractional distillation (2)	distillation fractionation	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)	**A** 0.25		**(1)**

Question Number		Indicative Content	Mark
QWC	*** (d)**	A description/explanation including some of the following points content could be shown in diagram(s) **practical procedure** • ignite magnesium /put magnesium in (Bunsen) flame • use of tongs/crucible / tube or gas jar of {oxygen/air} • lift lid (to let air in)- if crucible used • magnesium burns/oxidises/exothermic reaction • (bright) white {flame/light} • white powder/ash/solid formed **bonding** • magnesium atoms have 2 electrons in the outer shell • magnesium atoms {lose/transfer} electrons • form Mg^{2+}/ions with positive charge • oxygen atoms have 6 electrons in the outer shell • oxygen atoms gain electrons • forms O^{2-}/ions with negative charge • {8 electrons in /full/complete} outer shell • two electrons transferred/gained/lost • ions with opposite charges attract each other/ Mg^{2+} attracts O^{2-} ions	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description e.g. magnesium burns / magnesium atoms lose electrons • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description e.g. magnesium burns with a white flame / magnesium forms positive ions and oxygen forms negative ions • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description including the experiment and bonding e.g. magnesium burns with a white flame, magnesium atoms give their 2 outer electrons to oxygen atoms • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for Question = 12 marks)

(**Q05 1SC0/1CF, June 2014**)

Q12.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	A description including carbon (1) atom(s) (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	covalent Ignore giant molecular		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	fractional distillation (2)	distillation fractionation	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)	**A** 0.25		**(1)**

Question Number		Indicative Content	Mark
QWC	*** (d)**	A description/explanation including some of the following points content could be shown in diagram(s) **practical procedure** • ignite magnesium /put magnesium in (Bunsen) flame • use of tongs/crucible / tube or gas jar of {oxygen/air} • lift lid (to let air in)- if crucible used • magnesium burns/oxidises/exothermic reaction • (bright) white {flame/light} • white powder/ash/solid formed **bonding** • magnesium atoms have 2 electrons in the outer shell • magnesium atoms {lose/transfer} electrons • form Mg^{2+}/ions with positive charge • oxygen atoms have 6 electrons in the outer shell • oxygen atoms gain electrons • forms O^{2-}/ions with negative charge • {8 electrons in /full/complete} outer shell • two electrons transferred/gained/lost • ions with opposite charges attract each other/ Mg^{2+} attracts O^{2-} ions	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description e.g. magnesium burns / magnesium atoms lose electrons • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description e.g. magnesium burns with a white flame / magnesium forms positive ions and oxygen forms negative ions • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description including the experiment and bonding e.g. magnesium burns with a white flame, magnesium atoms give their 2 outer electrons to oxygen atoms • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for Question = 12 marks)

(**Q05 1SC0/2CF, June 2014**)

Q13.

Question Number	Answer	Additional guidance	Mark
(i)	A description to include • shared **electron**(s) (1) • {a pair of / two} (**electrons**) (1)	allow a diagram for both mark points reference to ionic bonding/ions scores 0 e.g. gains two electrons = 0	**(2)** AO 1 1

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation linking any two from • intermolecular forces / forces **between** molecules (1) • (intermolecular) forces {weak / take little energy to break}/ little energy to separate molecules (1) • boiling point is below room temperature / has a low boiling point (1)	if answer relates to the breaking of any type of **bond** first two marking points cannot be scored (but 3rd could) allow "attractions" instead of "forces"	**(2)** AO 1 1

(**Q22 1SC0/2CF, June 2018**)

Q14.

Question Number	Answer	Additional guidance	Mark
(i)	A description to include • shared **electron**(s) (1) • {a pair of / two} (**electrons**) (1)	allow a diagram for both mark points reference to ionic bonding/ ions scores 0 *e.g.* gains two electrons = 0	**(2)** AO 1 1

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation linking any two from • intermolecular forces / forces **between** molecules (1) • (intermolecular) forces {weak / take little energy to break}/ little energy to separate molecules (1) • boiling point is below room temperature / has a low boiling point (1)	if answer relates to the breaking of any type of **bond** first two marking points cannot be scored (but 3rd could) allow 'attractions' instead of 'forces'	**(2)** AO 1 1

(**Q06 1SC0/2CH, June 2018**)

Q15.

	Answer	Acceptable answers	Mark
(a)	sodium carbonate + calcium nitrate → sodium nitrate + calcium carbonate (2) LHS (1) RHS (1)	ignore solution / state symbols ignore incorrect attempts at balanced equation ignore mixtures of words and formulae	**(2)**
(b)(i)	C orange-red		**(1)**
(b)(ii)	A description including two points from CLEAN • clean (flame test) wire with (hydrochloric) acid (1) SAMPLE • put (wire) into solid (1) TEST • hold (wire) in (Bunsen) flame (1)	• moisten splint • put splint into solid • hold splint in (Bunsen) flame ignore : hold <u>over</u> flame use of tongs / spatula etc for equipment, max 1	**(2)**
(c)(i)	40/44 (1) (= 0.909) (any fraction) x 100 (1) (= 90.9 / 90.91 / 91(%))	correct answer (2) Ignore 90(%)	**(2)**
(c)(ii)	reaction is incomplete / not hot enough / not heated for long enough / use of impure calcium carbonate	ignore {gas escaping / not all collected / incorrect measurement}	**(1)**
(d)	D have high melting points		**(1)**

(**Q10 1SC0/1CF, June 2013**)

Q16.

	Answer	Acceptable answers	Mark
(a)	sodium carbonate + calcium nitrate → sodium nitrate + calcium carbonate (2) LHS (1) RHS (1)	ignore solution / state symbols ignore incorrect attempts at balanced equation ignore mixtures of words and formulae	**(2)**
(b)(i)	C orange-red		**(1)**
(b)(ii)	A description including two points	• moisten splint	**(2)**

	from CLEAN • clean (flame test) wire with (hydrochloric) acid (1) SAMPLE • put (wire) into solid (1) TEST • hold (wire) in (Bunsen) flame (1)	• put splint into solid • hold splint in (Bunsen) flame ignore : hold <u>over</u> flame use of tongs / spatula etc for equipment, max 1	
(c)(i)	40/44 (1) (= 0.909) (any fraction) x 100 (1) (= 90.9 / 90.91 / 91(%))	correct answer (2) Ignore 90(%)	**(2)**
(c)(ii)	reaction is incomplete / not hot enough / not heated for long enough / use of impure calcium carbonate	ignore {gas escaping / not all collected / incorrect measurement}	**(1)**
(d)	D have high melting points		**(1)**

(**Q04 1SC0/2CF, June 2013**)

Q17.

Question Number	Answer	Acceptable answers	Mark
	An explanation linking any two of • giant (covalent structure)/ giant molecule /macromolecule /large number of bonds (1) • strong (covalent) bonds (1) • large amount of heat /energy (needed to break bonds) (1)	Any reference to ionic bonding or intermolecular forces scores 0/2 lattice lots of/many bonds hard to break ignore hard to melt/high temperature needed	**(2)**

(**Q24 1SC0/1CF, June 2015**)

Q18.

Question Number	Answer	Acceptable answers	Mark
	An explanation linking any two of • giant (covalent structure)/ giant molecule /macromolecule /large number of bonds (1) • strong (covalent) bonds (1) • large amount of heat /energy (needed to break bonds) (1)	Any reference to ionic bonding or intermolecular forces scores 0/2 lattice lots of/many bonds hard to break ignore hard to melt/high temperature needed	**(2)**

(**Q12 1SC0/2CF, June 2015**)

Q19.

Question Number	Answers	Acceptable Answers	Mark
(a)(i)	<table><tr><td></td><td>chlorine-35</td><td>chlorine-37</td></tr><tr><td>number of protons</td><td>**17**</td><td>**17**</td></tr><tr><td>number of neutrons</td><td>**18**</td><td>**20**</td></tr><tr><td>number of electrons</td><td>**17**</td><td>**17**</td></tr></table> the four 17s (1) the 18 and 20 (1)		**(2)**

Question Number	Answers	Acceptable Answers	Mark
(a)(ii)	An explanation linking M1 average (mass of atoms/isotopes present) (1) M2 more chlorine-35 than chlorine-37 / higher {percentage / abundance} of Cl-35 / lower {percentage / abundance} of Cl-37 / (1)	 mean ignore weight 75% chlorine-35 / 25% chlorine-37/ chlorine-35 and chlorine-37 in ratio 3:1 / correct calculation to obtain 35.5 (2) eg[(75x35) + (25x37)]/100	**(2)**

Question Number	Answers	Acceptable Answers	Mark
(b)	Diagram showing one carbon and four chlorines four pairs of electrons shared between the carbon and chlorine atoms (1) fully correct (1)	use of dots or crosses or mixture of both ignore inner shells even if incorrect ignore symbols	**(2)**

Question Number		Indicative Content	Mark
QWC	*** (c)**	A response including some of the following points Note: (carbon to carbon) strong bonds is given in question Diamond: Uses and Properties • in cutting tools/engraving • drill bit • jewellery • diamond very hard/strong • attractive/lustrous • high melting point Explanations • giant molecular/covalent • each carbon atom bonded to four other carbon atoms • three dimensional structure • to break it lots of bonds would need to be broken • would need lot of energy/force Graphite: Uses and Properties • to make electrodes • a lubricant • sporting equipment • in pencils/drawing • graphite conducts electricity • soft Explanations • giant molecular/covalent • each carbon atom bonded to three other carbon atoms • each carbon atom has a free electron • delocalised electrons • (delocalised) electrons move to carry current • layers of carbon atoms • weak forces/bonds between layers/sheets • so layers/sheets can slide/rub off or over each other	**(6)**

Level	0	No rewardable content
1	1 - 2	• a limited description eg for either diamond ***or*** graphite states a correct Use ***or*** Property • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	• a simple description/explanation eg for ***both*** diamond ***and*** graphite states a correct Use ***or*** Property linked with at least **one relevant** explanation point **OR** for ***either*** diamond ***or*** graphite States a correct Use or Property linked to at least **two relevant** explanation points • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	5 - 6	• a detailed explanation eg for ***both*** diamond ***and*** graphite States a correct Use or Property linked to at least **three relevant** explanation points (in total) **OR** for ***either*** diamond ***or*** graphite States a correct Use or Property linked to at least **four relevant** explanation points (in total) • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

(**Q06 1SC0/1CH, June 2014**)

Q20.

Question Number	Answers	Acceptable Answers	Mark
(a)(i)	<table><tr><td></td><td>chlorine-35</td><td>chlorine-37</td></tr><tr><td>number of protons</td><td>**17**</td><td>**17**</td></tr><tr><td>number of neutrons</td><td>**18**</td><td>**20**</td></tr><tr><td>number of electrons</td><td>**17**</td><td>**17**</td></tr></table> the four 17s (1) the 18 and 20 (1)		**(2)**

Question Number	Answers	Acceptable Answers	Mark
(a)(ii)	An explanation linking M1 average (mass of atoms/isotopes present) (1) M2 more chlorine-35 than chlorine-37 / higher {percentage / abundance} of Cl-35 / lower {percentage / abundance} of Cl-37 / (1)	 mean ignore weight 75% chlorine-35 / 25% chlorine-37/ chlorine-35 and chlorine-37 in ratio 3:1 / correct calculation to obtain 35.5 (2) eg[(75x35) + (25x37)]/100	**(2)**

Question Number	Answers	Acceptable Answers	Mark
(b)	Diagram showing one carbon and four chlorines four pairs of electrons shared between the carbon and chlorine atoms (1) fully correct (1)	use of dots or crosses or mixture of both ignore inner shells even if incorrect ignore symbols	**(2)**

Question Number		Indicative Content	Mark
QWC	*** (c)**	A response including some of the following points Note: (carbon to carbon) strong bonds is given in question Diamond: Uses and Properties • in cutting tools/engraving • drill bit • jewellery • diamond very hard/strong • attractive/lustrous • high melting point Explanations • giant molecular/covalent • each carbon atom bonded to four other carbon atoms • three dimensional structure • to break it lots of bonds would need to be broken • would need lot of energy/force Graphite: Uses and Properties • to make electrodes • a lubricant • sporting equipment • in pencils/drawing • graphite conducts electricity • soft Explanations • giant molecular/covalent • each carbon atom bonded to three other carbon atoms • each carbon atom has a free electron • delocalised electrons • (delocalised) electrons move to carry current • layers of carbon atoms • weak forces/bonds between layers/sheets • so layers/sheets can slide/rub off or over each other	**(6)**

Level	0	No rewardable content
1	1 - 2	• a limited description eg for either diamond ***or*** graphite states a correct Use ***or*** Property • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	• a simple description/explanation eg for ***both*** diamond ***and*** graphite states a correct Use ***or*** Property linked with at least **one relevant** explanation point **OR** for ***either*** diamond ***or*** graphite States a correct Use or Property linked to at least **two relevant** explanation points • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	5 - 6	• a detailed explanation eg for ***both*** diamond ***and*** graphite States a correct Use or Property linked to at least **three relevant** explanation points (in total) **OR** for ***either*** diamond ***or*** graphite States a correct Use or Property linked to at least **four relevant** explanation points (in total) • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

(**Q05 1SC0/2CH, June 2014**)

Q21.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	**2** Na **(1)** + Cl_2 → **2** NaCl (1) Ignore + in front of the 2s	maximum 1 mark if any balancing number is added in front of Cl_2 or if any of the formulae are changed eg 4Na + $2Cl_2$ → 4NaCl or Na + 1/2 Cl_2 → NaCl score (1) do not allow negative signs in front of balancing numbers	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	2.5 / 4.0 (1) their fraction x 100 (1) (=62.5)	0.625 or 5/8 62.5/63 with {no/incorrect} working correct working with {no/wrong}	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(iii)	A ionic		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(iv)	23 + 35.5 (=58.5) Ignore g	58.5 with {no/incorrect} working 23 + 35.5 with {no/wrong} answer do not allow 58/59 without working	**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	$\frac{24}{120}$ (1) their fraction x 100 (1) (=20%)	1/5 or 0.2 20 with {no/incorrect} working correct working with {no/wrong} answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	CH_3	2 CH_3 / C_1H_3 / H_3C do not allow just 1:3	**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	An explanation linking any **two** from weak {forces/attractions} (1) between {molecules/particles/them}/ intermolecular (1) little {heat/energy} needed {to separate the molecules/overcome force(s) between molecules} (1)	maximum **1** mark if breaking bonds between atoms/breaking down {molecules/ particles}/breaking covalent bonds specific weak forces eg Van der Waals/London weak bonds do not allow covalent bonds are weak /weak bonds between atoms ignore weak hydrogen bonds weak bonds between {molecules / particles} do not allow intramolecular 'little energy is needed to break the bonds' only if it is clear that {covalent/single} bonds are not being broken	**(2)**

(Total for Question = 11 marks)

(**Q04 1SC0/1CF, June 2014**)

Q22.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	**2** Na **(1)** + Cl_2 → **2** NaCl (1) Ignore + in front of the 2s	maximum 1 mark if any balancing number is added in front of Cl_2 or if any of the formulae are changed eg 4Na + $2Cl_2$ → 4NaCl or Na + 1/2 Cl_2 → NaCl score (1) do not allow negative signs in front of balancing numbers	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	2.5 / 4.0 (1) their fraction x 100 (1) (=62.5)	0.625 or 5/8 62.5/63 with {no/incorrect} working correct working with {no/wrong}	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(iii)	A ionic		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(iv)	23 + 35.5 (=58.5) Ignore g	58.5 with {no/incorrect} working 23 + 35.5 with {no/wrong} answer do not allow 58/59 without working	**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	$\frac{24}{120}$ (1) their fraction x 100 (1) (=20%)	1/5 or 0.2 20 with {no/incorrect} working correct working with {no/wrong} answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	CH_3	2 CH_3 / C_1H_3 / H_3C do not allow just 1:3	**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	An explanation linking any **two** from weak {forces/attractions} (1) between {molecules/particles/them}/ intermolecular (1) little {heat/energy} needed {to separate the molecules/overcome force(s) between molecules} (1)	maximum **1** mark if breaking bonds between atoms/breaking down {molecules/ particles}/breaking covalent bonds specific weak forces eg Van der Waals/London weak bonds do not allow covalent bonds are weak /weak bonds between atoms ignore weak hydrogen bonds weak bonds between {molecules / particles} do not allow intramolecular 'little energy is needed to break the bonds' only if it is clear that {covalent/single} bonds are not being broken	**(2)**

(Total for Question = 11 marks)

(**Q04 1SC0/2CF, June 2014**)

Q23.

Question number	Indicative content	Mark
*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. Substance A • giant ionic structure • (high melting point) strong electrostatic attractions between ions • due to a lot of energy required to overcome strong forces • (electrical conductivity) in solid ions strongly attracted in lattice ions cannot move, so poor conductor when solid • when molten ions free to move, so good conductor when molten Substance B • metallic structure • (high melting point) strong attraction between metal ions and delocalised electrons • due to a lot of energy required to overcome strong forces between particles in solid • (electrical conductivity) in solid delocalised electrons • free to move throughout metallic lattice, so good conductor when solid • delocalised electrons and ions free to move when molten, so good conductor when molten Substance C • covalent simple molecular • (low melting point) weak intermolecular forces/ attractions between molecules • little energy needed to separate molecules, so low melting point • (electrical conductivity) in solid and when molten no delocalised electrons or ions to carry charge, so poor conductor	(6) AO1 / AO3

Level	Mark	Additional Guidance	General additional guidance – the decision within levels Eg - At each level, as well as content, the scientific coherency of what is stated backed up by detail will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance Identifies correct structure types OR explains a property of one substance	Possible candidate responses • A – giant ionic, B – metallic, C – simple molecular • High mp (for A or B) due to strong bonds (between atoms / ions) • Low mp for C due to weak intermolecular forces • A conducts when molten – ions can move • B conducts when solid / molten – electrons can move • C does not conduct – no free ions or electrons can't move
Level 2	3–4	Additional guidance Identifies correct structure type for one substance AND explains at least one property of that substance OR explains at least two properties	Possible candidate responses • A – giant ionic AND high mp due to strong bonds between ions AND poor conductor when solid – ions not free to move; good conductor when molten – ions free to move • B – metallic AND high mp due to strong bonds between {atoms / metal ions and delocalised electrons} AND good conductor when solid and molten – electrons free to move • C – simple molecular AND low mp due to weak intermolecular forces AND poor conductor when solid and molten – no ions and electrons not free to move
Level 3	5–6	Additional guidance Identifies correct structure types and explains properties for least two substances	Possible candidate responses • A – giant ionic AND high mp due to strong bonds between ions AND poor conductor when solid – ions not free to move; good conductor when molten – ions free to move AND / OR • B – metallic AND high mp due to strong bonds between {atoms / metal ions and delocalised electrons} AND good conductor when solid and molten – electrons free to move AND / OR • C – simple molecular AND low mp due to weak intermolecular forces AND poor conductor when solid and molten – no ions and electrons not free to move

Level	Mark	Descriptor
	0	No awardable content
Level 1	1-2	• Demonstrates elements of chemical understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Deconstructs scientific information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. (AO3)
Level 2	3-4	• Demonstrates chemical understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Deconstructs scientific information and provides some logical connections between scientific concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently (AO3)
Level 3	5-6	• Demonstrates accurate and relevant chemical understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Deconstructs scientific information and provide logical connections between scientific concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently. (AO3)

(**Q06c 1SC0/1CH, Nov 2021**)

Q24.

Question number	Answer	Additional guidance	Mark
	A description including • {silver nitrate / solution} has **ions** (1) • {silver / solid / metal} has **delocalised electrons** (1) • {ions / electrons} move (1)	reject silver nitrate has electrons {that move / delocalised} for MP1 allow {free / sea of} electrons reject silver has ions {that move / delocalised} for MP2 allow charged particles move MP3 for idea of movement of charge (even if, for example, MP1 and/or MP2 reversed or wrong)	**(3)** **AO2-1**

(**QU06b 1SC0/1CF, June 2025**)

Q25.

Question number	Answer	Additional guidance	Mark
	A description including • {silver nitrate / solution} has **ions** (1) • {silver / solid / metal} has **delocalised electrons** (1) • {ions / electrons} move (1)	reject silver nitrate has electrons {that move / delocalised} for MP1 allow {free / sea of} electrons reject silver has ions {that move / delocalised} for MP2 allow charged particles move MP3 for idea of movement of charge (even if, for example, MP1 and/or MP2 reversed or wrong)	**(3)** **AO2-1**

(**QU02b 1SC0/1CH, June 2025**)

Q26.

Question number	Answer	Additional guidance	Mark
	A description including • conductivity increases and then decreases (1) AND any one *quantitative description* from • conductivity increases (from 0) to 150 (g dm^{-3}) (1) • conductivity reaches maximum at 150 (g dm^{-3}) (1) • conductivity then decreases from 150 (to 500) (g dm^{-3}) (1)	allow positive correlation for increases and negative correlation for decreases	**(2)**

(**Q03e 1SC0/2CF, Nov 2020**)

Q27.

Question number	Answer	Additional guidance	Mark
	• particles are same size when they should be different sizes (1) • model is in 2D but crystal is 3D (1)	Allow reverse statements giving correct information.	**(2)**

(**Q05ai 1SC0/1CH, SAM 2016**)

Q28.

Question Number	Answer	Additional guidance	Mark
	A description to include the following points	first two marks can be given for a suitable diagram	**(3)** AO 3 3a
	• insert electrodes (into aqueous solution)(1)	allow anode **and** cathode	
	• connect to electrical supply / powerpack /battery/cell (1)	allow carry out an electrolysis experiment alone / see if solution conducts electricity (1) allow pass an electric current through (the solution) (1) ignore electricity alone	
	• bulb lights / ammeter shows current / electrolyte decomposes (1)	allow correct observation at one electrode (1)	

(**Q19 1SC0/2CH, June 2018**)

Q29.

Question number	Answer	Additional guidance	Mark
(i)	H^+ **and** Na^+ **only** circled		**(1)** **AO1-1**

Question number	Answer	Additional guidance	Mark
(ii)	so that they do not react (with the electrolyte/sodium sulfate solution / products formed)	allow graphite is unreactive allow so they do not corrode	**(1)** **AO1-1**

Question number	Answer	Additional guidance	Mark
(iii)	An explanation linking: • **electrons** (1) • move (through graphite) / are {delocalised / free / sea of electrons} (1)	ignore 'charged particles' for MP1 but allow for MP2 reject ions for MP1 and MP2 'electrons in bonds/ electrons in outer shell' scores MP1 only MP2 depends on **electrons** or charged particles being mentioned ignore any other material about structure of graphite, correct or otherwise	**(2)** **AO1-1**

(**Q04c 1SC0/1CF, June 2022**)

Q30.

Question Number	Answer	Additional guidance	Mark
(i)	so that the ions can move	allow the solid does not conduct allow conducts when {in solution/liquid} ignore conducts when molten allow so cations / anions can move ignore so particles can move reject electrons move	**(1)** AO 2 2

Question Number	Answer	Mark
(ii)	OH^- and Cl^- only circled	**(1)** AO 1 1

Question Number	Answer	Additional guidance	Mark
(iii)	An explanation linking one of the following pairs of points • use a crucible/metal container (instead of a beaker) (1) • which will not break/melt (when heated strongly) (1) OR • add a Bunsen burner (under the container) (1) • because heat needed to melt the lead bromide / to make the lead bromide a liquid (1)	allow blow torch ignore hot water bath	**(2)** AO 3 3b

(**Q13 1SC0/1CF, June 2018**)

Q31.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	D the transition metals		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	D malleable		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	non-flammable		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(ii)	has a low density		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	A description including (yellow-) green (1) gas (1)	any shade of green do not allow just 'yellow' do not allow green in combination with other colours eg blue-green	 **(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	hydrogen + chlorine → hydrogen chloride lhs (1) rhs (1) Ignore formulae in addition to all of the names	if formulae are used, do not allow h or CL or superscripts $H_2 + Cl_2$ on lhs 2HCl on rhs reactants in either order do not allow a mixture of words and formulae for both marks eg $H_2 + Cl_2$ → hydrogen chloride scores 1 mark for rhs do not allow hydrochloric acid /hydrochloride/hydrogen chlorine	**(2)**

(Total for Question = 8 marks)

(**Q01 1SC0/1CF, June 2014**)

Q32.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	D the transition metals		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	D malleable		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	non-flammable		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(ii)	has a low density		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	A description including (yellow-) green (1) gas (1)	 any shade of green do not allow just 'yellow' do not allow green in combination with other colours eg blue-green	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	hydrogen + chlorine → hydrogen chloride lhs (1) rhs (1) Ignore formulae in addition to all of the names	if formulae are used, do not allow h or CL or superscripts $H_2 + Cl_2$ on lhs 2HCl on rhs reactants in either order do not allow a mixture of words and formulae for both marks eg $H_2 + Cl_2$ → hydrogen chloride scores 1 mark for rhs do not allow hydrochloric acid /hydrochloride/hydrogen chlorine	**(2)**

(Total for Question = 8 marks)

(**Q01 1SC0/2CF, June 2014**)

Q33.

Question number	Answer	Additional guidance	Mark
	An explanation linking: • (calcium) nitrate {is soluble/ dissolves}/ (calcium) carbonate {is insoluble/ does not dissolve} (1) • so **ions** {free to move in solution / not free in solid} (1)	 calcium nitrate dissolves so ions can move (2) or reverse argument for calcium carbonate	**(2)**

(**Q02c 1SC0/1CH, June 2019**)

Q34.

Question number	Indicative content	Mark
*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlines in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. Do not credit separation techniques other than distillation (e.g. crystallisation/ simply evaporating off the water) or additional steps to distillation that would not work. Allow distil off (some) water and then crystallise the remaining (concentrated) sodium chloride solution. Allow fractional distillation. AO1 (6 marks) **SODIUM CHLORIDE** • ionic compound • giant lattice • positive (sodium) ions and negative (chloride) ions • strong electrostatic attraction between ions • lots of energy to overcome attraction/ bonds **WATER** • simple covalent/ molecular • strong covalent bonds between atoms in a molecule • weak forces between molecules • little energy needed to overcome the intermolecular forces **SEPARATION** • use distillation – with condenser or simple apparatus: delivery tube into test tube in ice water • water has much lower boiling point • water will distil but sodium chloride will not • water collected after being condensed • sodium chloride remains in flask	**(6)** **AO1 1** **AO1 2**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of chemical understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3–4	• Demonstrates chemical understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5–6	• Demonstrates accurate and relevant chemical understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Descriptor	Additional Guidance
	0	No rewardable material.	Read whole answer and ignore all incorrect material/ discard any contradictory material then:
Level 1	1–2	Additional Guidance a basic description of one of the types of bonding or the separation technique	Possible candidate response sodium chloride is ionic (1) use distillation (1) sodium chloride has ionic bonding and water has covalent bonding (2) sodium chloride has strong ionic bonds which take a lot of energy to break (2) heat the mixture and condense the water (2)
Level 2	3–4	Additional Guidance a description of two of the aspects: bonding in NaCl/ intermolecular forces in water/ distillation	Possible candidate response water is a simple molecular covalent compound, there are weak intermolecular forces which take little energy to break but sodium chloride is ionic (3) sodium chloride has ionic bonding, there are strong electrostatic forces of attraction between oppositely charged ions, which take a lot of energy to break and the solution is separated by distillation (3) use distillation because water has a lower boiling point than sodium chloride so water will distil but sodium chloride will not, water can be collected after it has been condensed and the sodium chloride will remain in the flask. This is because sodium chloride is ionic with strong bonds. (4)
Level 3	5–6	Additional Guidance An explanation of **both** of the types of bonding **and** of the separation technique	sodium chloride has strong ionic bonds which take a lot of energy to break whereas water has intermolecular forces which does not take a lot of energy to break. Heat the mixture and condense the water, sodium chloride is left in the flask (5) Sodium chloride is ionic, the electrostatic attractions between ions take a lot of energy to break. Water is covalent, not a lot of energy is used to overcome the intermolecular forces. Use distillation because water has a lower boiling point than sodium chloride so water will distil but sodium chloride will not, water can be collected after it has been condensed and the sodium chloride will remain in the flask. (6)

(**QU06c 1SC0/1CH, June 2023**)

Q35.

Question number	Indicative content
*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO2 (6 marks)** • solid calcium chloride contains ions/cations/anions which are charged particles • solid calcium chloride does not conduct because charged particles are not free to move because they are held together by strong electrostatic forces/ionic bonds in lattice • molten calcium chloride solution conducts because ions/cations/anions are present which are charged particles and are free to move • the ions have separated and move to electrode of opposite charge • diamond does not conduct because it is giant molecular covalent with no free electrons • outer electrons of carbon atoms used in bonding • zinc metallic structure consists of delocalised free electrons which can move between layers of metals atoms/cations

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	• The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2) • Lines of reasoning are unsupported or unclear. (AO2)
Level 2	3-4	• The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2) • Lines of reasoning mostly supported through the application of relevant evidence. (AO2)
Level 3	5-6	• The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO4) • Lines of reasoning are supported by sustained application of relevant evidence. (AO2)

(**Q06c 1SC0/1CF, SAM 2016**)

Q36.

Question number	Answer	Additional guidance	Mark
	An explanation linking • ammonium chloride solution conducts electricity and solid ammonium chloride does not conduct electricity (1) • ammonium chloride contains **ions** (1) • in solution **ions** can move / in solid **ions** cannot move (1)	Answer must refer to both solid and solution for full marks	**(3)** **AO3**

(**Q01c 1SC0/2CH, Nov 2021**)

Q37.

Question number	Answer	Additional guidance	Mark
	An explanation linking • ammonium chloride solution conducts electricity and solid ammonium chloride does not conduct electricity (1) • ammonium chloride contains **ions** (1) • in solution **ions** can move / in solid **ions** cannot move (1)	Answer must refer to both solid and solution for full marks	**(3)** **AO3**

(**Q05c 1SC0/2CF, Nov 2021**)

Q38.

Question Number	Answer	Mark
	An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (2 marks): • weak, intermolecular forces (1) **AND** **EITHER** • molecules have enough energy (at room temperature) (1) • overcome these forces (1) **OR** • forces are not strong enough (1) • to hold molecules together in lattice/solid (at room temperature) (1)	**(3)**

(Q03c 1SC0/1CF, SAM)

Q39.

Question Number	Answer	Mark
	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (2 marks) • (lattice of) positive ions in a sea of electrons (1) • strong forces of attraction (between metal ions and electrons) (1) • therefore large amount of heat energy needed to melt (1)	**(3)**

(Q04c 1SC0/1CH, SAM)

Q40.

Question number	Answer	Additional guidance	Mark
	An explanation linking **weak** {forces between molecules / intermolecular forces} (1) (intermolecular forces need) little {heat/energy} required (1)	reject weak covalent bond for both mark points allow **weak** intermolecular bonds / **weak** bonds **between molecules** ignore easy to break ignore 'easier to separate molecules' ignore needs a low temperature to break	**(2)**

(**Q03b 1SC0/2CH, June 2019**)